

Knowledge-Based System Environment

Example: CLIPS

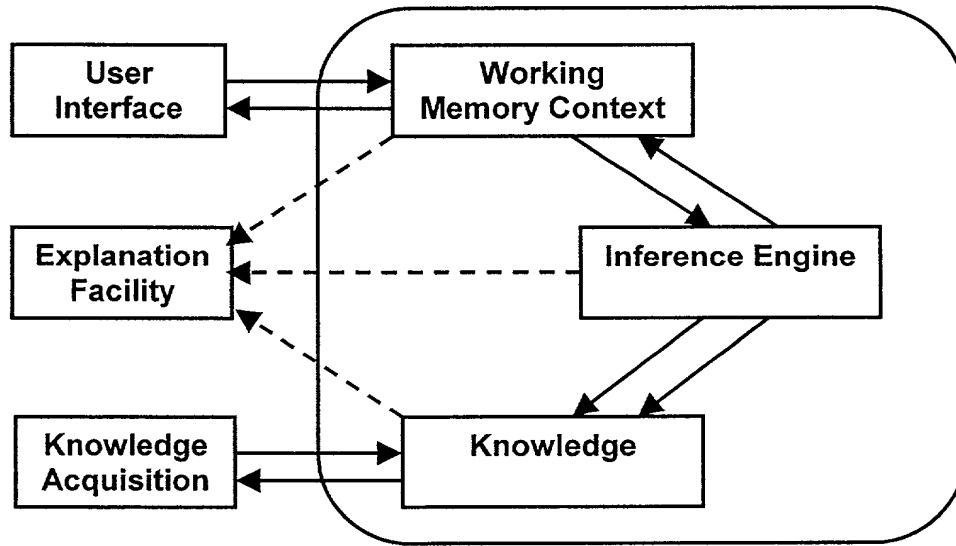


FIG. 1

BELIEF NETWORKS

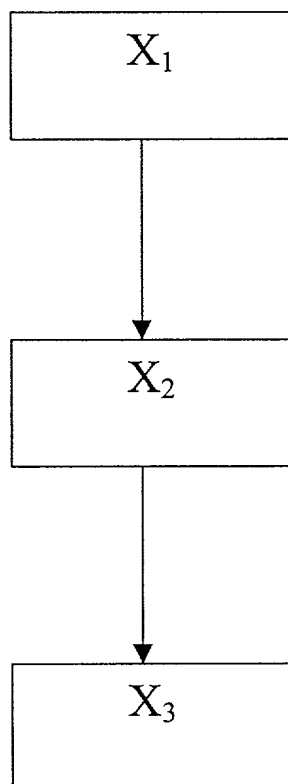


Fig. 2

3-D ELICIT MODEL

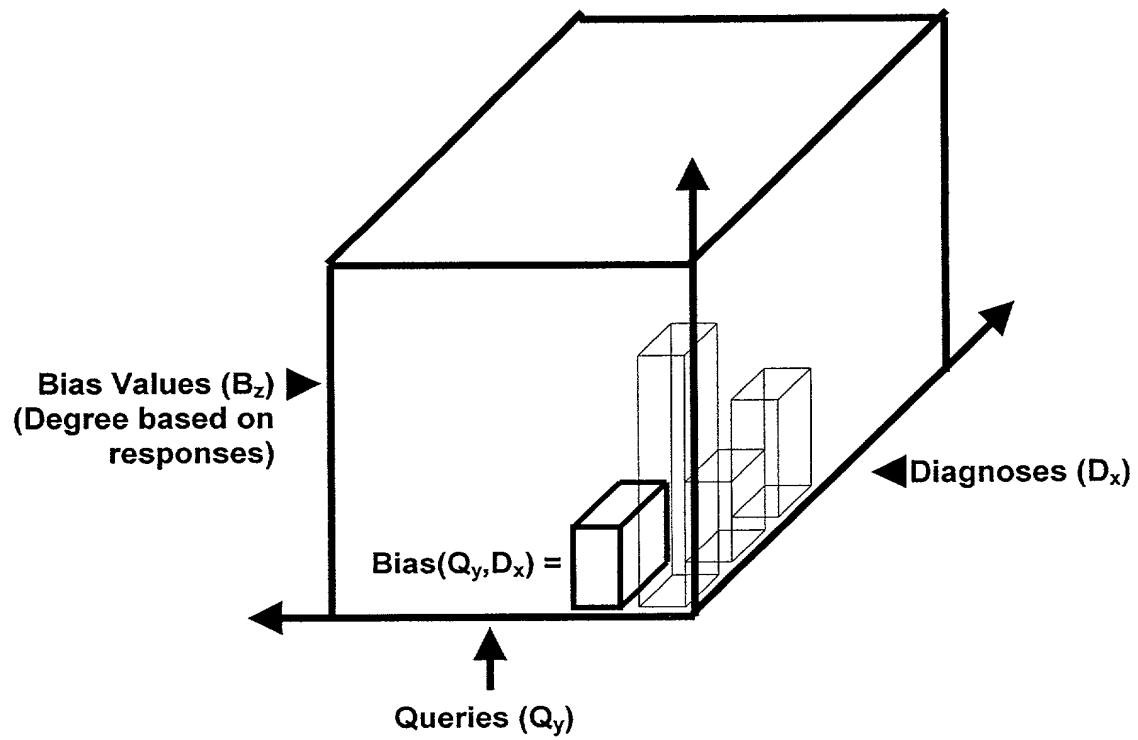
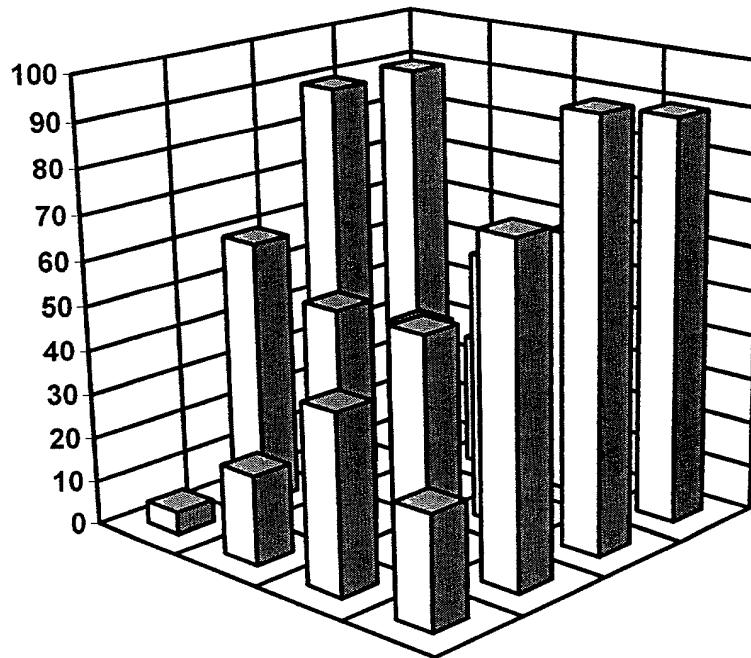


FIG. 3

Sample 3-D Model



$$\text{Bias} = B(D_1, Q_1) = 5$$

	D ₁	D ₂	D ₃	D ₄
Q ₁	5	60	90	90
Q ₂	20	50	40	30
Q ₃	40	50	60	60
Q ₄	25	75	95	90

FIG. 4

End Implementation

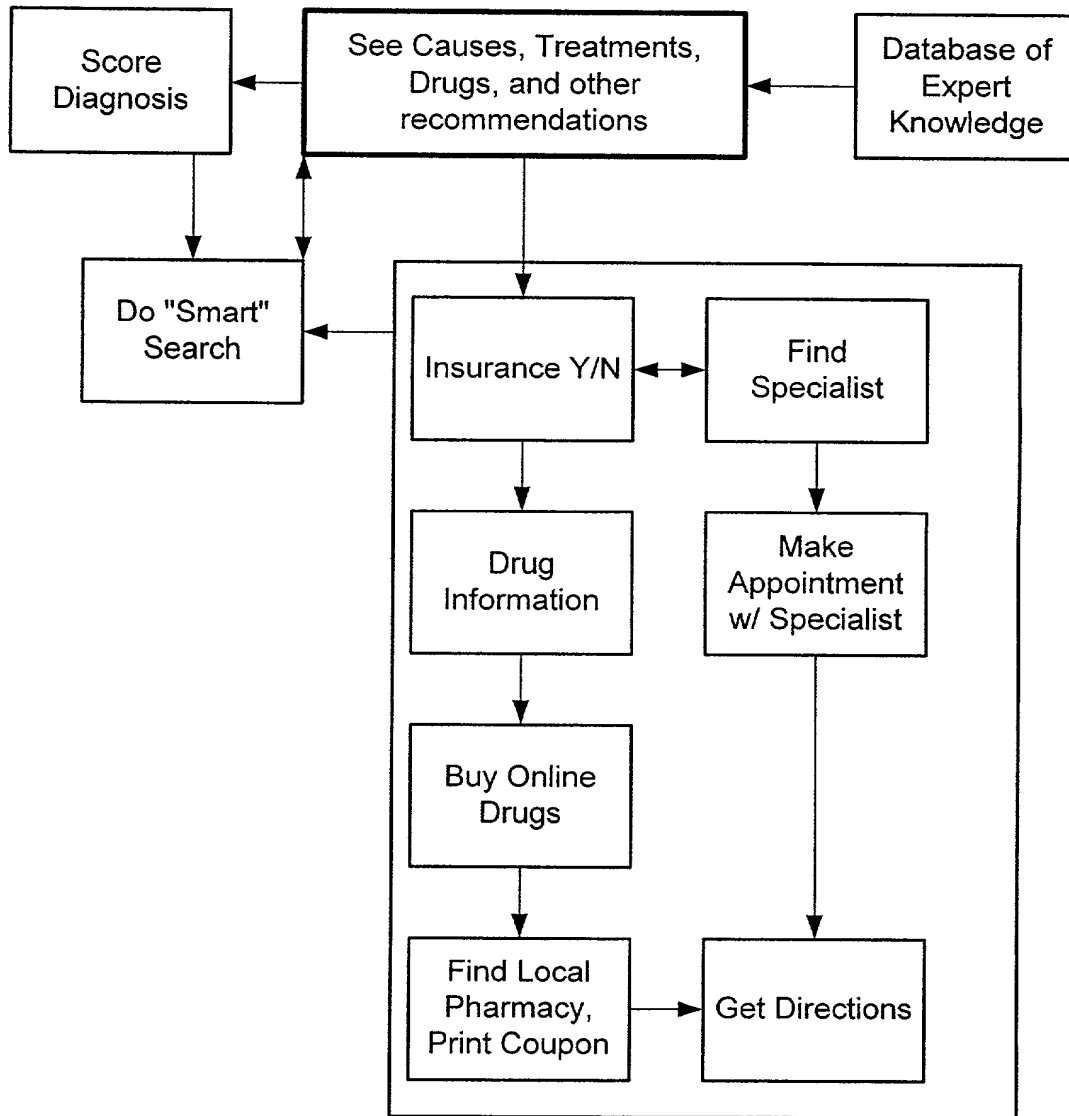


Fig. 5

Process - Acquisition of Expert Data

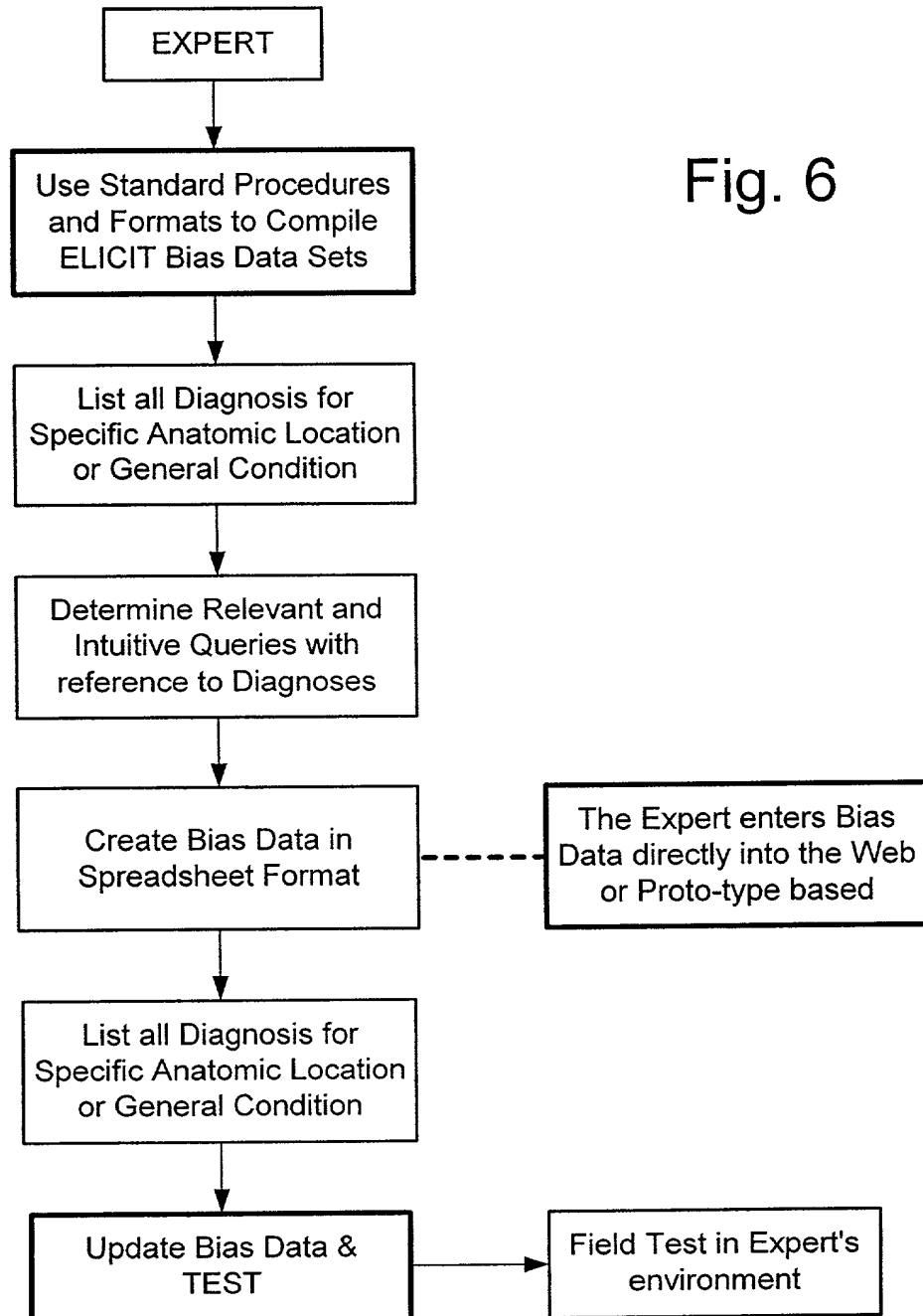


Fig. 6

SAMPLE EXPERT 3D-DATA INPUT SCREEN

MENU

Add Diagnosis

Add Query

Diagnoses ▶

	▼ Queries ▼	ACL Tear	PCL Tear	MM Tear
Edit	Was there an injury?	90 <input type="checkbox"/>	90 <input type="checkbox"/>	90 <input type="checkbox"/>
Edit	Did you trip or fall?	20 <input type="checkbox"/>	30 <input type="checkbox"/>	30 <input type="checkbox"/>
Edit	Were you in an accident involving a vehicle?	30 <input type="checkbox"/>	30 <input type="checkbox"/>	20 <input type="checkbox"/>
Edit	Were you playing a sport?	70 <input type="checkbox"/>	70 <input type="checkbox"/>	70 <input type="checkbox"/>
Edit	Did you twist your knee?	70 <input type="checkbox"/>	70 <input type="checkbox"/>	70 <input type="checkbox"/>
Edit	Did you injure your knee while jumping?	60 <input type="checkbox"/>	60 <input type="checkbox"/>	60 <input type="checkbox"/>
Edit	Was the injury pain immediate?	80 <input type="checkbox"/>	70 <input type="checkbox"/>	60 <input type="checkbox"/>
Edit	Was the injury pain delayed?	20 <input type="checkbox"/>	30 <input type="checkbox"/>	30 <input type="checkbox"/>
Edit	Was the injury swelling immediate?	80 <input type="checkbox"/>	70 <input type="checkbox"/>	60 <input type="checkbox"/>
Edit	Was the injury swelling delayed?	20 <input type="checkbox"/>	30 <input type="checkbox"/>	30 <input type="checkbox"/>
Edit	Was there swelling above or around the kneecap?	95 <input type="checkbox"/>	85 <input type="checkbox"/>	80 <input type="checkbox"/>
Edit	Walking in general or level ground	10 <input type="checkbox"/>	10 <input type="checkbox"/>	40 <input type="checkbox"/>
Edit	Walking up or down hills	20 <input type="checkbox"/>	20 <input type="checkbox"/>	40 <input type="checkbox"/>
Edit	Running	30 <input type="checkbox"/>	20 <input type="checkbox"/>	40 <input type="checkbox"/>
Edit	Biking	20 <input type="checkbox"/>	10 <input type="checkbox"/>	30 <input type="checkbox"/>
Edit	Squatting	30 <input type="checkbox"/>	20 <input type="checkbox"/>	80 <input type="checkbox"/>
Edit	While sitting	20 <input type="checkbox"/>	10 <input type="checkbox"/>	40 <input type="checkbox"/>

FIG. 7

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Set Response Ranking

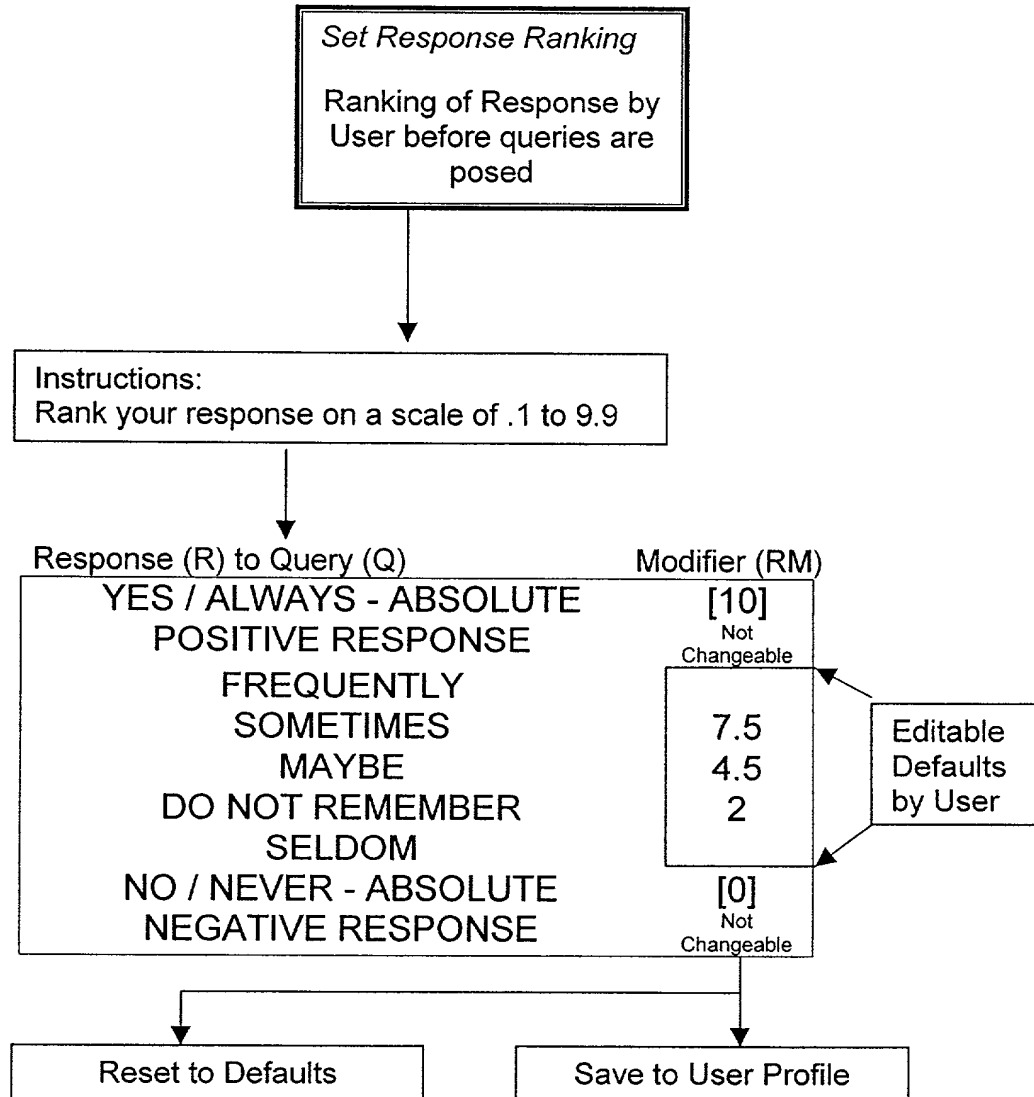


FIG. 8

COMPUTER

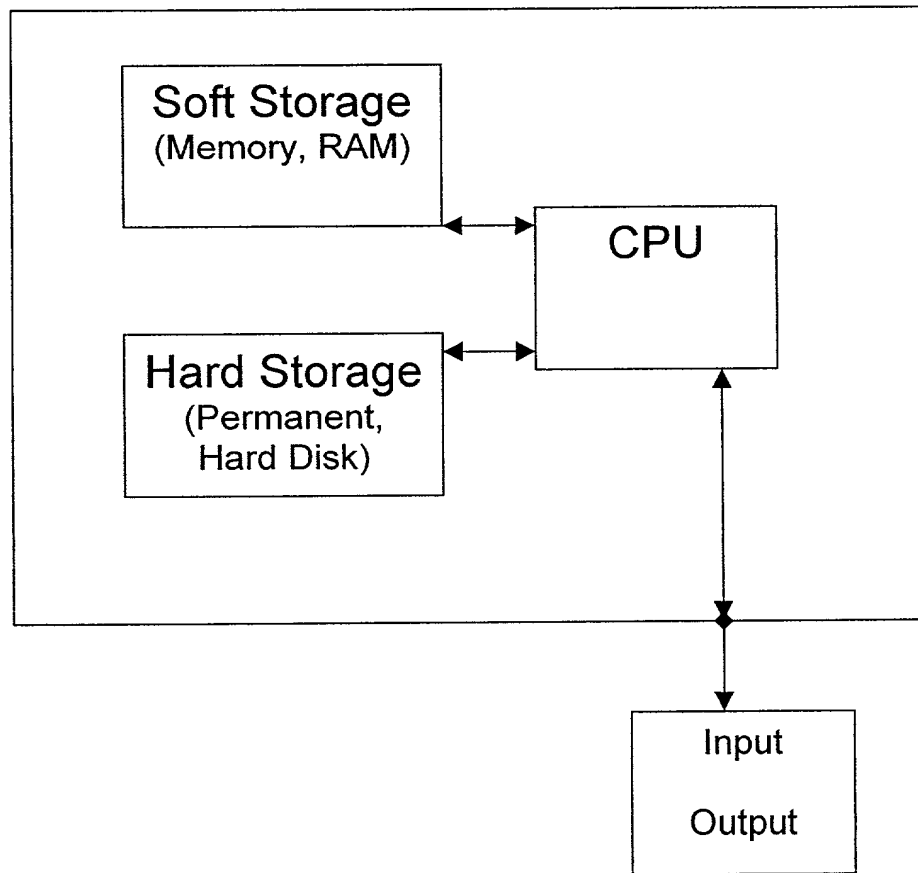


Fig. 9

General Description

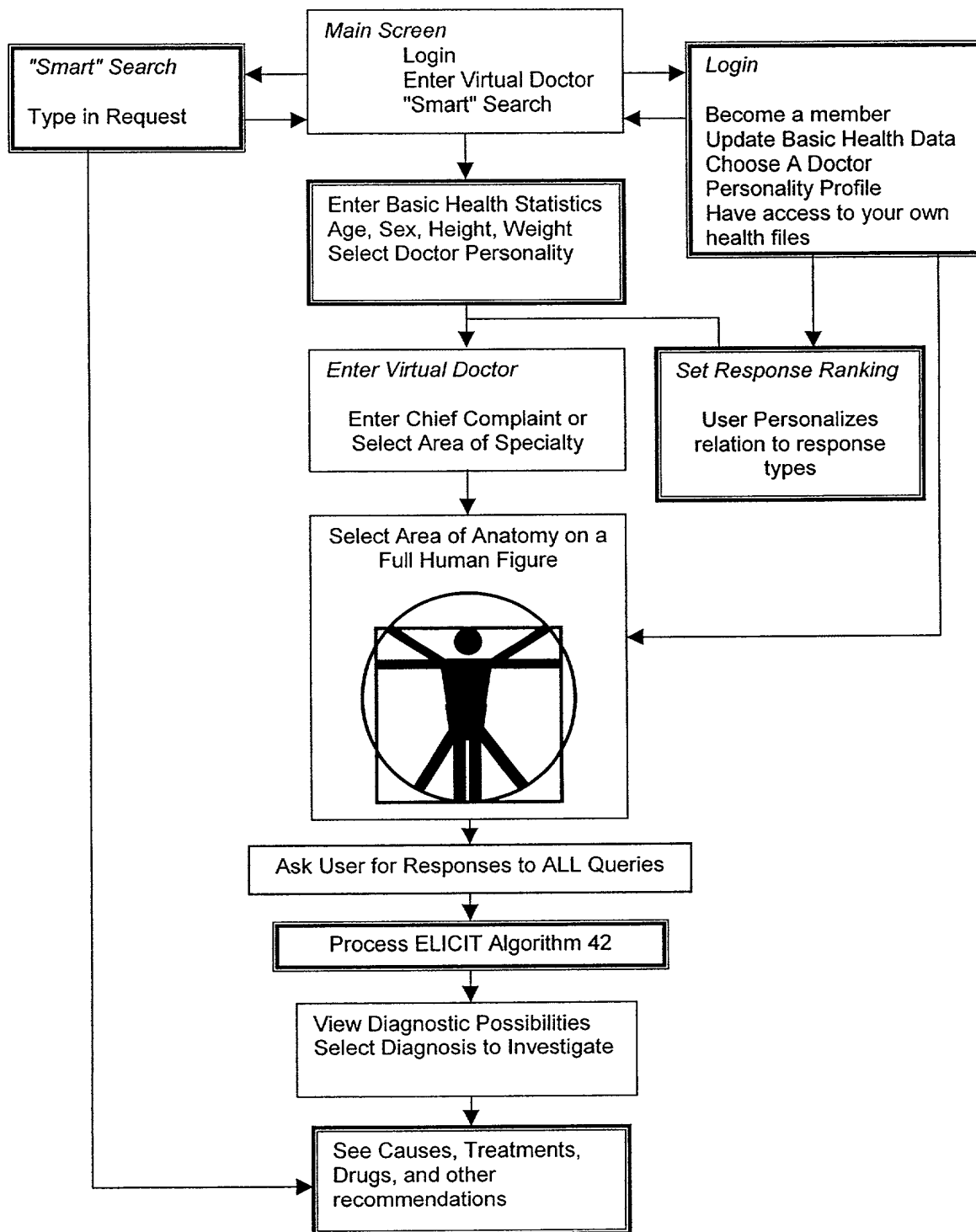


FIG. 10

LOGIN / ENTER BASIC HEALTH STATS

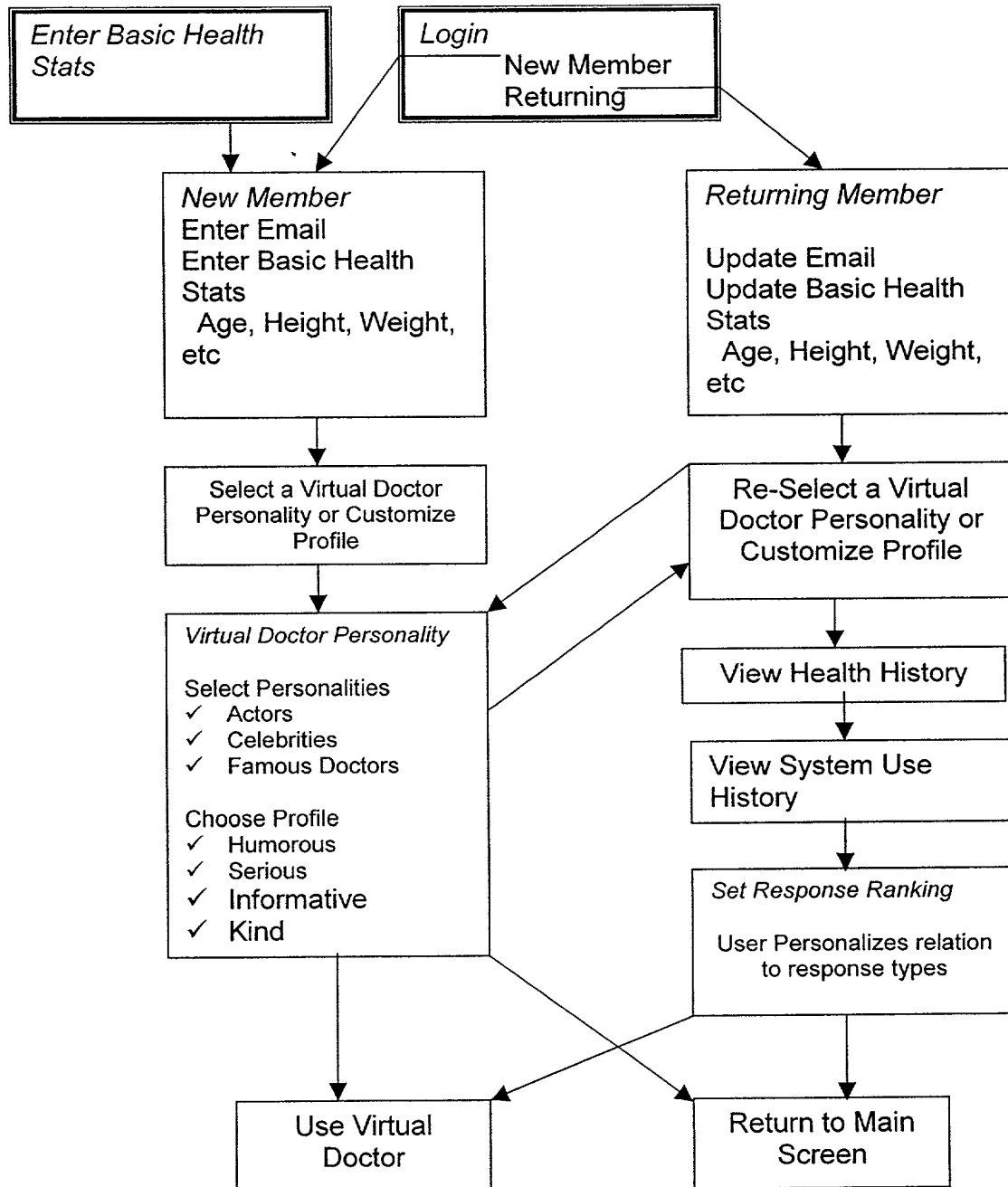


FIG. 11

"SMART" SEARCH

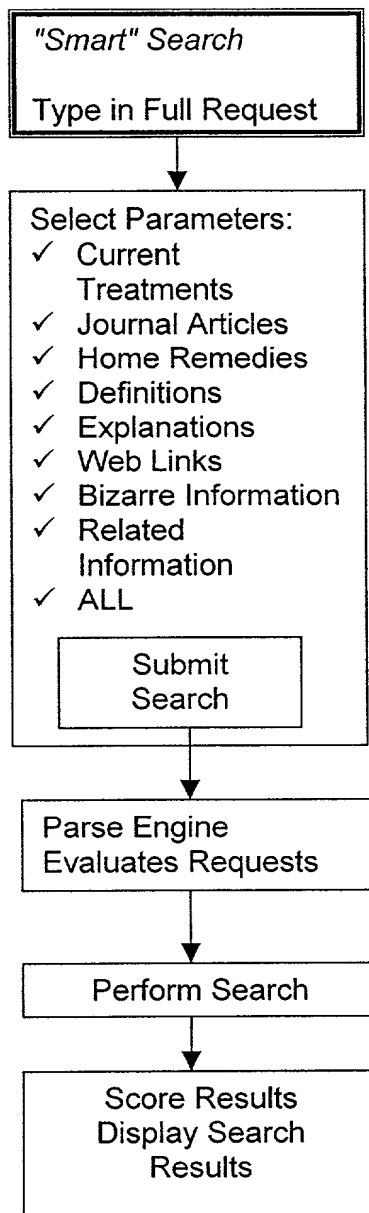


Fig. 12

ELICIT ALGORITHM 42
(PROCESSING RESPONSES TO QUERIES)

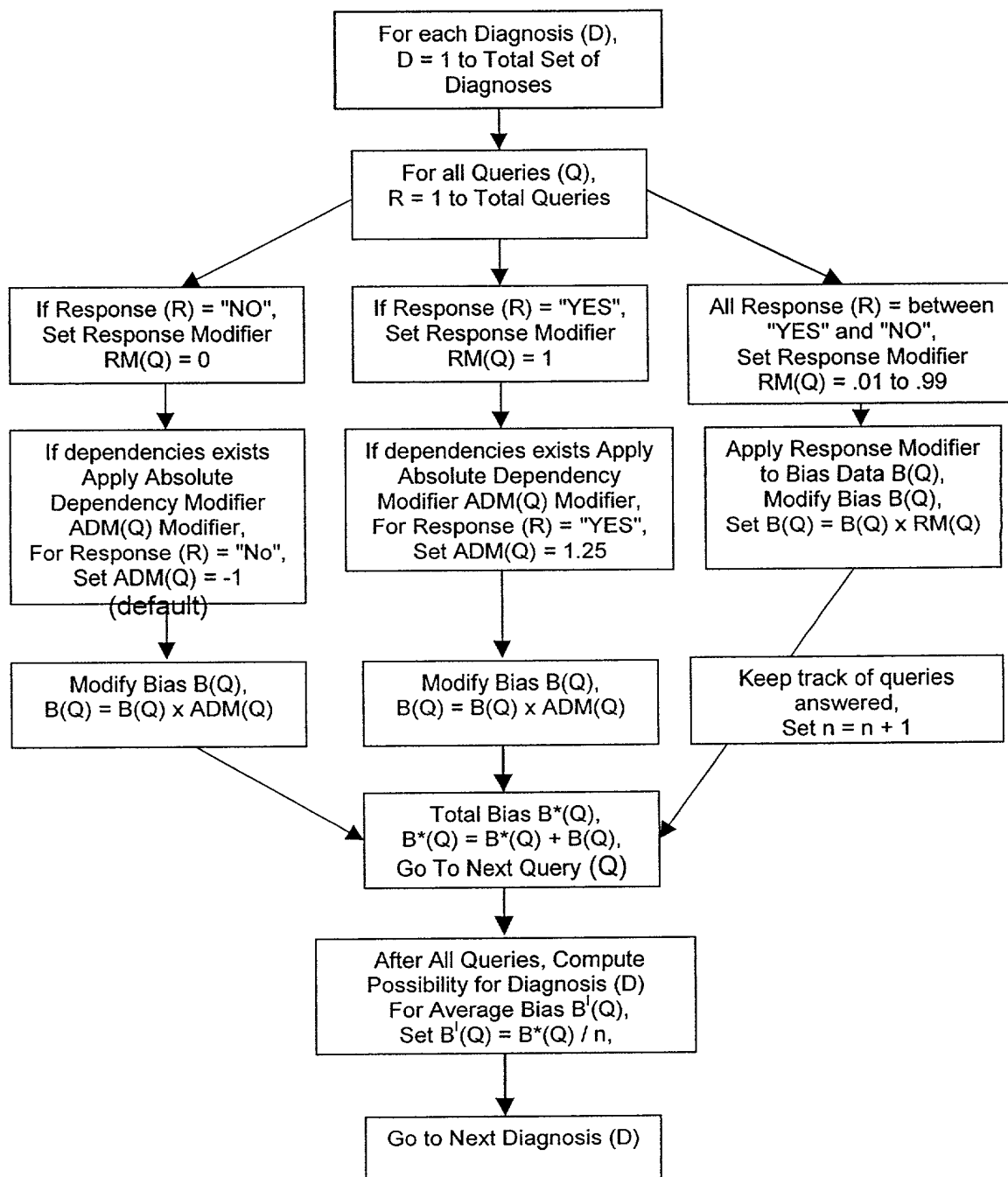


FIG. 13

Please circle/select all the areas where you feel tenderness or pain/discomfort

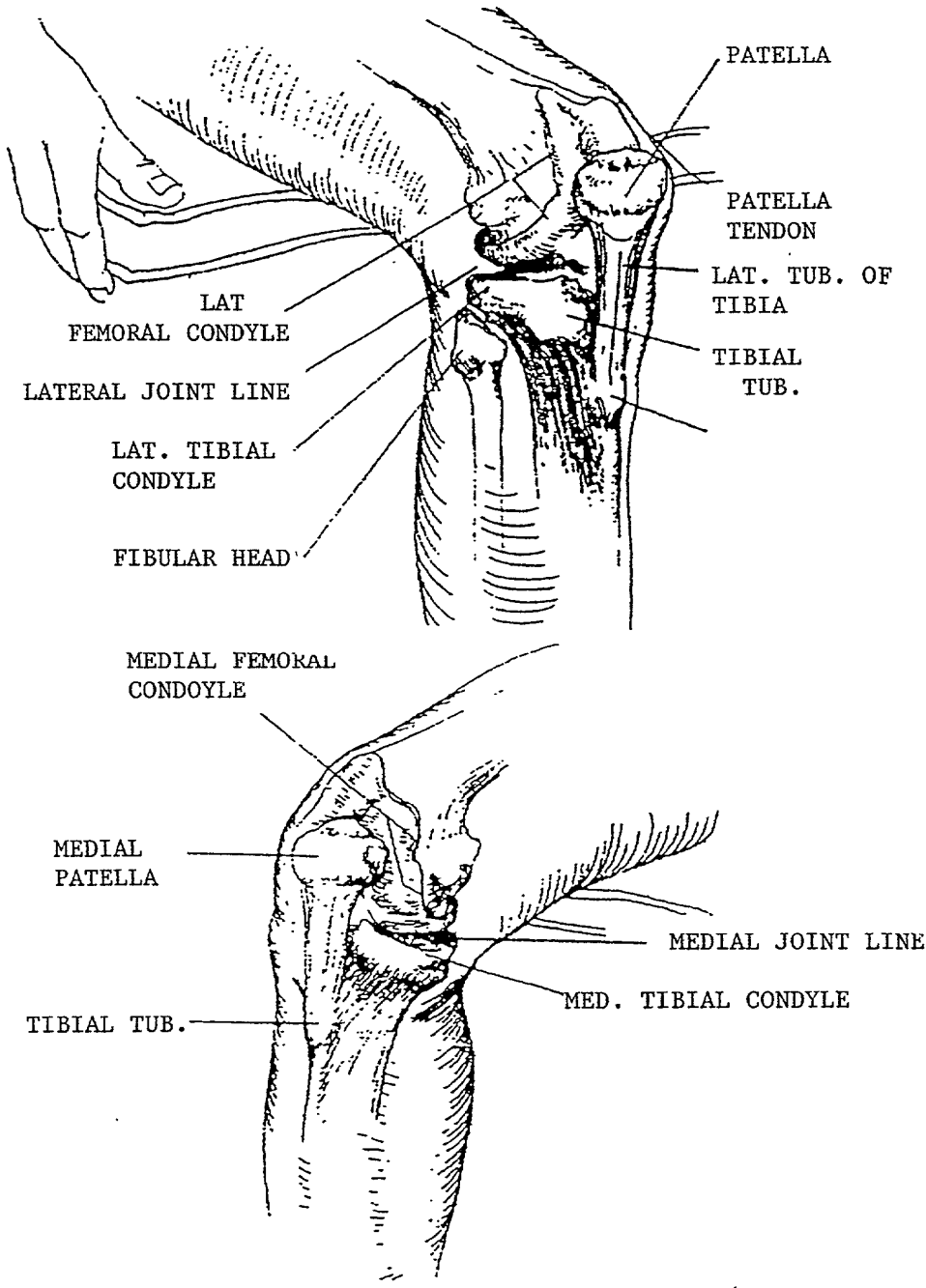


FIG. 14



**Don't wait for Doctors
online anymore!**

Your Personal Online Doctor...Now!

*Want to know what could be wrong
with you instantly and get specific
information on insurance, treatments,
specialists, perscriptions, home
remedies and more ?*

*Just use our free "Virtual Doctor"
application with utilizes advanced
logic technology to accurately
determine your paticular aligment.
Of course, you should never use this
service to replace professional medical
advice from your physican. In fact, we
recommend always to seek receive.
professional medical advice regardless
of the diagnostic response you receive.*

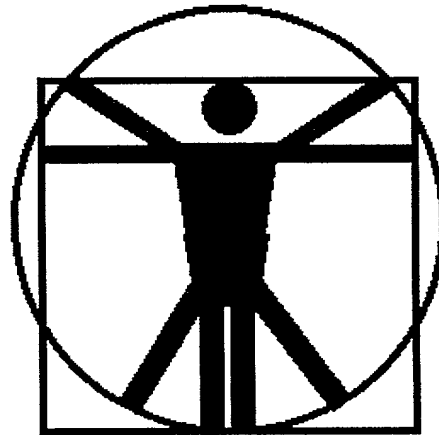


FIG. 15

Non-Injury Activites. Please select any activity that causes pain or discomfort.

<input type="text" value="No"/>	Walking in general or level ground
<input type="text" value="No"/>	Walking up or down hills
<input type="text" value="No"/>	Running
<input type="text" value="Yes"/>	Biking
<input type="text" value="Sometimes"/>	Squatting
<input type="text" value="Maybe"/>	While sitting
<input type="text" value="Don't remember"/>	Extended sitting
<input type="text" value="No"/>	In motion standing up
<input type="text" value="No"/>	In motion sitting DOWN

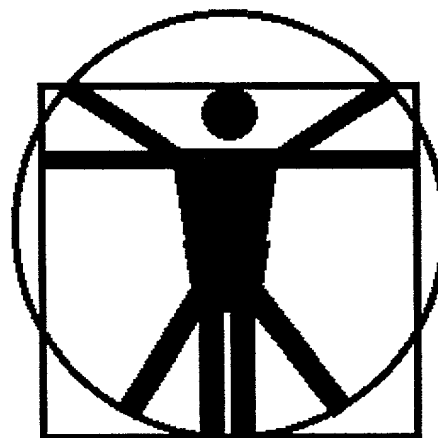


FIG. 16

ELICIT Scalar Range, Rules, Possibility Scoring

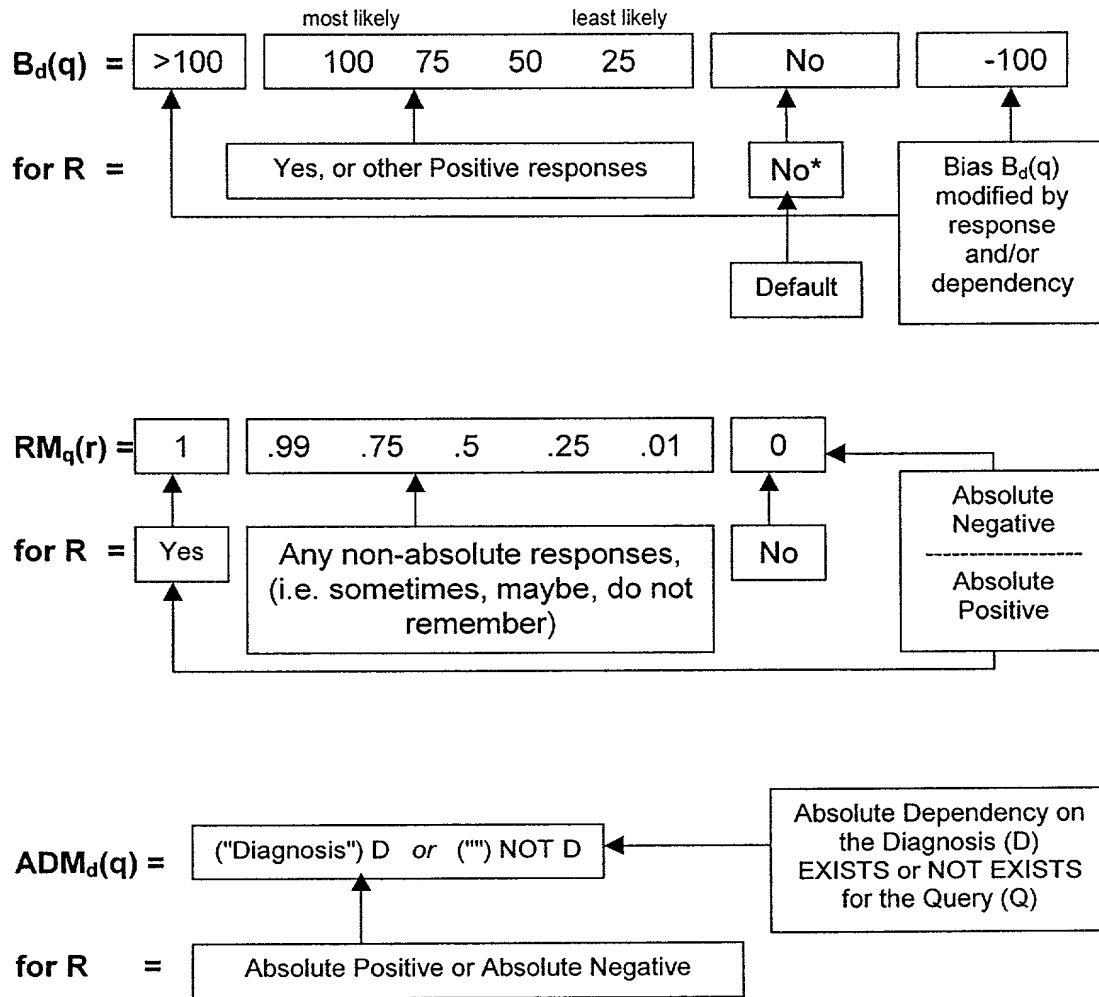


FIG. 17

Your Personal Online Doctor...Now!

Enter Questionnaire

Edit Data

Edit Data by
Queries

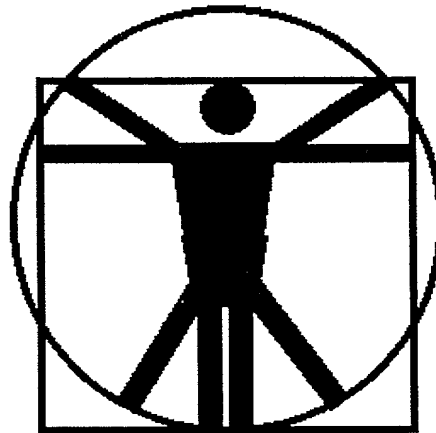


FIG. 18

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Pre-Diagnostic Questionnaire

Knee

Answer
Questions
that
apply

MAIN

Clear All

<input type="checkbox"/>	Was it a recent injury?
<input type="checkbox"/>	Did you trip or fall?
<input type="checkbox"/>	Were you in an accident involving a vehicle?
<input checked="" type="checkbox"/> Yes	Were you playing a sport?
<input type="checkbox"/>	Did you twist your knee?
<input type="checkbox"/>	Did you injur your knee while jumping?
<input type="checkbox"/>	Was the injury pain immediate?
<input type="checkbox"/>	Was the injury pain delayed?
<input type="checkbox"/>	Was the injury swelling immediate?
<input type="checkbox"/>	Was the injury swelling delayed?
<input checked="" type="checkbox"/> Yes	Is there swelling above or around the kneecap?
<input checked="" type="checkbox"/> Sometimes	Walking in general or level ground
<input checked="" type="checkbox"/> Sometimes	Walking up or down hills
<input checked="" type="checkbox"/> Yes	Running
<input checked="" type="checkbox"/> Sometimes	Biking
<input checked="" type="checkbox"/> Sometimes	Squatting
<input type="checkbox"/>	While sitting
<input type="checkbox"/>	Extended sitting
<input type="checkbox"/>	Inmotion standing UP
<input type="checkbox"/>	In motion sitting DOWN
<input type="checkbox"/>	Has your knee ever locked up?
<input type="checkbox"/>	Do you feel a general stiffness?
<input type="checkbox"/>	You CAN NOT straighten your leg?
<input type="checkbox"/>	Does your knee give out?
<input type="checkbox"/>	Does your knee give out while walking straight?
<input type="checkbox"/>	Does your knee give out while changing directions?
<input type="checkbox"/>	Do you feel a loose body floating around?
<input checked="" type="checkbox"/> Yes	Is the skin color around your knee normal?
<input type="checkbox"/>	Is the skin color around your knee black or blue?
<input type="checkbox"/>	Is there redness around the knee area?
<input type="checkbox"/>	Is there progressive angulation ?
<input checked="" type="checkbox"/> Yes	Is there grinding or grating?

Fig. 19

Total Questions Answered

2

Resume

Possibility	Area Diagnosis
34.88	Ankle Sprain III
33.75	Ankle Sprain I, II
29.25	Achilles rupture
28.13	Osteochondritis Dissecans
14.63	Morton's Neuroma
12.38	Stress Fx of 2nd metatarsal
11.25	Plantar Fasciitis
7.88	Pez Planus
7.88	Accessory Navicular
5.63	Bunion
4.5	Posterior tibialis syndrome
3.38	Hammer toe
3.38	Degenerative Arthritis
2.25	Gout
2.25	Infection

Fig. 20

20/29

Edit Fuzzy Data

Fig. 21

MAIN

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New Diagnosis

PHYSICAL AREA Knee

AREA DIAGNOSIS Patella Malalignment

Fuzzy Questions Fuzzy Data		Diagnostically Dependent	Fuzzy Response
Was it a recent injury?	30	<input type="checkbox"/> Yes	
Did you trip or fall?	20	<input type="checkbox"/> Yes	
Were you in an accident involving a vehicle?	20	<input type="checkbox"/> Yes	
Were you playing a sport?	50	<input type="checkbox"/> Yes	Yes
Did you twist your knee?	40	<input type="checkbox"/> Yes	
Did you injury your knee while jumping?	70	<input type="checkbox"/> Yes	
Was the injury pain immediate?	60	<input type="checkbox"/> Yes	
Was the injury pain delayed?	40	<input type="checkbox"/> Yes	
Was the injury swelling immediate?	20	<input type="checkbox"/> Yes	
Was the injury swelling delayed?	70	<input type="checkbox"/> Yes	Yes
Is there swelling above or around the kneecap?	40	<input type="checkbox"/> Yes	Sometimes
Walking in general or level ground	40	<input type="checkbox"/> Yes	Sometimes
Walking up or down hills	70	<input type="checkbox"/> Yes	Yes
Running	80	<input type="checkbox"/> Yes	Sometimes
Biking	70	<input type="checkbox"/> Yes	Sometimes
Squatting	70	<input type="checkbox"/> Yes	
While sitting	70	<input type="checkbox"/> Yes	
Extended sitting	90	<input type="checkbox"/> Yes	
In motion standing UP	60	<input type="checkbox"/> Yes	

Edit Fuzzy Data

MAIN

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New Diagnosis

In motion sitting DOWN	40	<input type="checkbox"/> Yes
Has your knee ever locked up?	40	<input type="checkbox"/> Yes
Do you feel a general stiffness?	50	<input type="checkbox"/> Yes
You CAN NOT straighten your leg?	20	<input type="checkbox"/> Yes
Does your knee give out?	80	<input type="checkbox"/> Yes
Does your knee give out while walking straight?	80	<input type="checkbox"/> Yes
Does your knee give out while changing directions?	50	<input type="checkbox"/> Yes
Do you feel a loose body floating around?	30	<input type="checkbox"/> Yes
Is the skin color around your knee normal?	90	<input type="checkbox"/> Yes
Is the skin color around your knee black or blue?	20	<input type="checkbox"/> Yes
Is there redness around the knee area?	10	<input type="checkbox"/> Yes
Is there progressive angulation?	10	<input type="checkbox"/> Yes
Is there grinding or grating?	80	<input type="checkbox"/> Yes
Is there any popping or snapping?	70	<input type="checkbox"/> Yes
Do you feel weakness in the knee?	30	<input type="checkbox"/> Yes
Do you have a fever?	10	<input type="checkbox"/> Yes
Do you generally feel weak or tired?	20	<input type="checkbox"/> Yes
Is there numbness anywhere?	10	<input type="checkbox"/> Yes
At the time of injury, did you feel your knee pop out?	50	<input type="checkbox"/> Yes
At the time of injury, did you feel a crack?	50	<input type="checkbox"/> Yes
medial femoral condyle check	50	<input type="checkbox"/> Yes
medial joint line check	20	<input type="checkbox"/> Yes
medial tibial plateau check	20	<input type="checkbox"/> Yes
medial patella check	90	<input type="checkbox"/> Yes

Yes

Yes

Sometimes

Sometimes

Yes

Maybe

Fig. 22

Edit Fuzzy Data

MAIN

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New Diagnosis

Fig. 23

	lateral patella check	70	<input type="checkbox"/> Yes
	tibial tubercle check	40	<input type="checkbox"/> Yes
	lateral femoral condyle check	30	<input type="checkbox"/> Yes
	lateral joint line check	20	<input type="checkbox"/> Yes
	lateral tibial plateau check	10	<input type="checkbox"/> Yes
	anterior patella check	40	<input type="checkbox"/> Yes
	posterior knee check	10	<input type="checkbox"/> Yes
	Is there swelling above or around the kneecap?	55	<input type="checkbox"/> Yes
	Is there swelling in front of the kneecap?	20	<input type="checkbox"/> Yes
	Is there constant pain?	20	<input type="checkbox"/> Yes
	Is there chronic pain?	25	<input type="checkbox"/> Yes
	Age 16 to 40	60	<input type="checkbox"/> Yes
	40 to 60	40	<input type="checkbox"/> Yes
	60 to 80	25	<input type="checkbox"/> Yes
	over 80	15	<input type="checkbox"/> Yes
	Do you feel a bump or mass?	10	<input type="checkbox"/> Yes
	Can you straighten your knee, or feel a tender band of tissue on the inside	40	<input type="checkbox"/> Yes
	Pain wakes at night	15	<input type="checkbox"/> Yes
	Have you ever felt your knee cap pop out?	70	<input type="checkbox"/> Yes
			<input type="checkbox"/> Yes
			<input type="checkbox"/> Yes
			<input type="checkbox"/> Yes
			<input type="checkbox"/> Yes
			<input type="checkbox"/> Yes
			<input type="checkbox"/> Yes

Edit Fuzzy Data

Fig. 24

MAIN

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New Diagnosis

		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes
		<input type="checkbox"/> Yes

PHYSICAL AREA Knee
AREA DIAGNOSIS Patella Malalignment

PreviousNext

863	Total Percentages
20	Total Queries
43.15	Final Calculation

MAIN		Re-evaluate			Was there an injury?	Answer:
% Possibility	Area Diagnosis		►			Maybe
37.5	Pat.Disloc.			90		
36.51	Degenerative Arthritis			30		
36.31	ACL Tear			90		
36.04	LM Tear			90		
35.12	LCL Sprain			80		
34.95	MCL Sprain			80		
33.04	Inflammatory Arthritis			10		
33.03	PCL Tear			90		
32.98	MM Tear			90		
31	Plica			50		
26.06	Patella Malalignment			30		
24.89	Infection			20		
23.7	Loose Body			70		
21.93	Patellar bursitis			50		
20.77	Tumor			30		
18.1	Patella tendinitis (Osg/Schl)			40		

Fig. 25

PRE-DIAGNOSTIC QUESTIONNAIRE FOR THE KNEE

Name _____ Age _____ Sex _____ Height _____ Weight _____

Injury Activities

- ☐ Was there an injury?
- ☐ Did you trip or fall?
- ☐ Were you in an accident involving a vehicle?
- ☐ Were you playing a sport?
- ☐ Please enter the sport you were playing:
- ☐ Was it a twisting injury?
- ☐ Did you injure your knee in a jumping sport?
- ☐ Was the pain immediate or delayed?
- ☐ Was the swelling immediate or delayed?

Injury History:

- ☐ At the time of your injury, did you feel a pop in the knee?
- ☐ At the time of injury, did you feel a crack in the knee?
- ☐ Have you ever felt your knee cap pop out?

If your injury was not recent, please select all the activities that create or induce pain or discomfort:

- ☐ Walking in general, on level ground
- ☐ Walking up or down hills
- ☐ Running
- ☐ Biking
- ☐ Squatting
- ☐ While sitting
- ☐ Extended Sitting
- ☐ In Motion Standing Up
- ☐ In Motion Sitting Down

Please select all the conditions that apply to the physical state of the knee or the local area of your discomfort:

- ☐ Has your knee ever locked up?
- ☐ Do you feel a general stiffness?
- ☐ You CANNOT straighten your leg?
- ☐ Does your knee give out?
- ☐ Does it give out while walking straight?
- ☐ Does it give out while changing directions?
- ☐ Do you feel a "loose body" floating in or around the knee? i.e. a "marble" floating around?
- ☐ Is the skin color normal?
- ☐ Is the skin color black or blue?
- ☐ Is there any redness around the area?
- ☐ Is there any progressive angulation?
- ☐ Is there any grinding or grating?
- ☐ Is there any popping or snapping?
- ☐ Is there any weakness in the knee?

How do you generally feel. Please select any of the general health conditions that apply to you:

- ☐ Do you currently have a fever or had a fever in the past 12 hours?
- ☐ Do you generally feel weak or tired?
- ☐ Is there any numbness anywhere?

A few more questions:

- ☐ When you straighten your leg or knee, can you feel a tender band of soft tissue on the inside part of your knee?
- ☐ Is there swelling above or around the knee?
- ☐ Do you feel a bump or mass around the knee?
- ☐ Is there swelling in front of the kneecap?
- ☐ Is there any chronic or constant pain?

Fig. 26

Query Object in Database

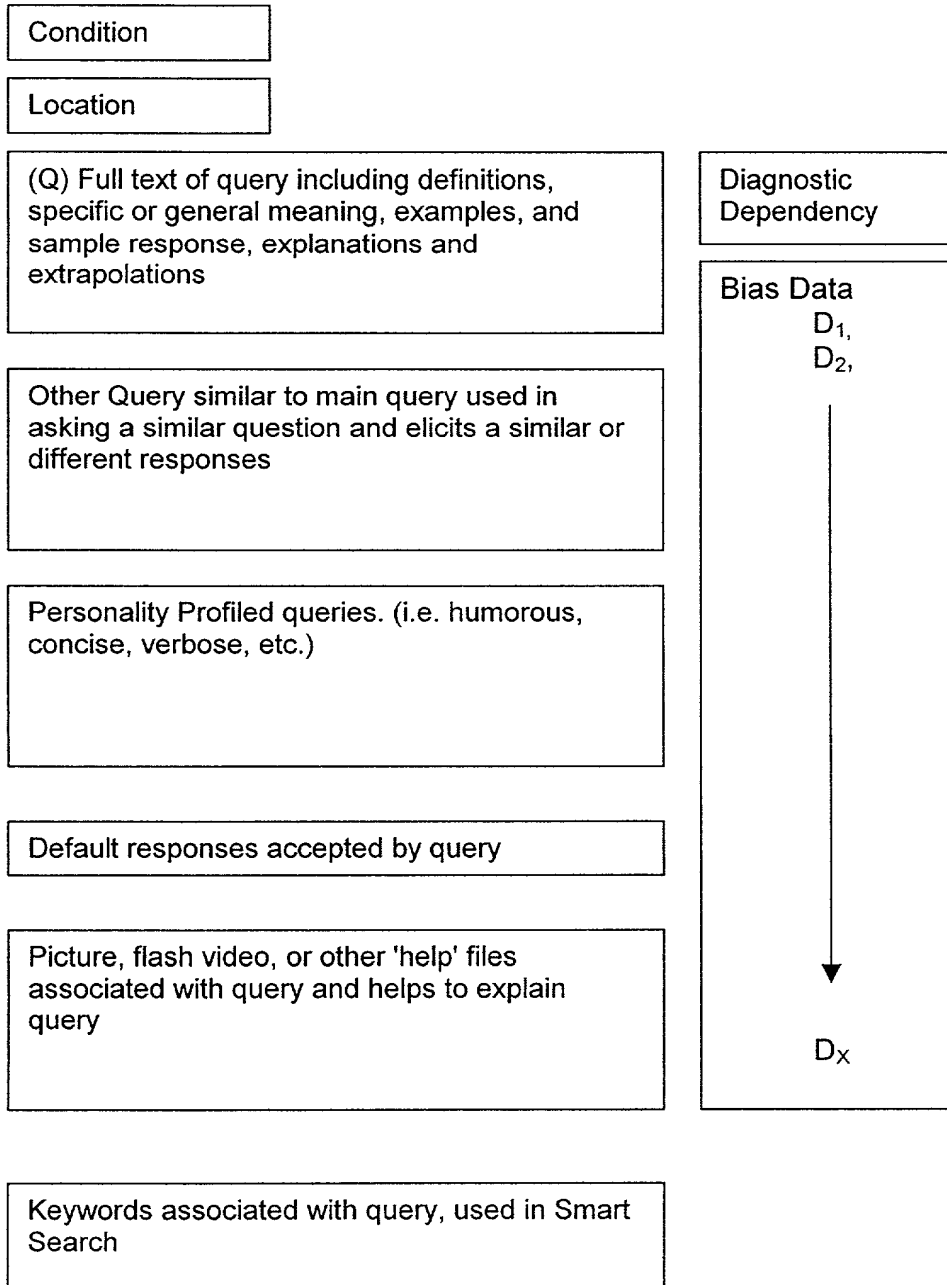


FIG. 27

"Hammertoe", "5", "10", "5", "5", "5", "5", "5", "25", "30", "40", "5", "5", "5", "95", "5", "5", "5", "5", "5", "20", "45", "60", "35", "35", "15", "20", "5", "5", "5", "5", "10", "10", "10", "30", "10", "30", "10", "10", "10", "35", "65", "45", "95", "80"

"Ankle Sprain
III", "95", "60", "40", "90", "90", "95", "20", "10", "90", "95", "95", "95", "95", "20", "95", "40", "5", "10", "5", "10", "5", "5", "5", "5", "15", "5", "20", "5", "5", "95", "95", "25", "5", "5", "5", "5", "5", "15", "35", "60", "50", "30", "15", "5", "5"

"Ankle Sprain I,
II", "90", "60", "40", "90", "90", "85", "20", "10", "80", "85", "90", "90", "95", "65", "75", "90", "30", "5", "10", "5", "10", "5", "5", "5", "5", "15", "5", "20", "5", "5", "25", "95", "20", "5", "10", "5", "5", "55", "15", "25", "60", "50", "30", "15", "5", "5"

"Achilles
rupture", "90", "60", "40", "15", "80", "80", "10", "90", "45", "60", "65", "25", "20", "20", "70", "20", "10", "95", "50", "10", "10", "5", "5", "5", "5", "15", "5", "20", "5", "5", "20", "20", "10", "5", "25", "5", "5", "5", "5", "10", "20", "70", "30", "10", "5", "5"

"Osteochondritis
Dissecans", "75", "50", "50", "60", "70", "60", "25", "10", "50", "60", "70", "65", "65", "65", "75", "95", "70", "5", "5", "5", "10", "5", "5", "5", "5", "15", "5", "20", "5", "5", "40", "65", "15", "5", "10", "5", "5", "5", "10", "25", "70", "30", "20", "15", "5", "5"

"Morton's
Neuroma", "25", "40", "20", "5", "10", "5", "10", "5", "40", "65", "70", "5", "5", "5", "95", "5", "5", "5", "5", "5", "5", "5", "5", "15", "15", "90", "5", "5", "5", "5", "5", "5", "35", "20", "95", "10", "25", "10", "25", "60", "45", "25", "5", "5"

"Bunion", "5", "20", "5", "5", "5", "5", "5", "5", "25", "30", "40", "5", "5", "5", "95", "5", "5", "5", "5", "5", "5", "85", "95", "95", "40", "40", "40", "20", "55", "5", "5", "5", "15", "10", "10", "90", "10", "30", "15", "10", "25", "50", "65", "50", "20", "35"

"Stress Fx of 2nd
metatarsal", "15", "40", "10", "10", "35", "20", "90", "5", "80", "85", "90", "5", "5", "5", "60", "5", "5", "5", "5", "5", "5", "10", "10", "5", "10", "20", "5", "20", "5", "5", "5", "5", "5", "5", "15", "15", "95", "20", "5", "20", "50", "30", "15", "10", "5"

"Degenerative
Arthritis", "10", "5", "5", "5", "5", "5", "5", "5", "60", "70", "80", "55", "55", "45", "85", "85", "25", "5", "5", "5", "5", "65", "45", "35", "5", "45", "45", "25", "5", "5", "30", "30", "15", "20", "20", "70", "5", "20", "40", "30", "10", "50", "65", "85", "30", "25"

"Plantar
Fasciitis", "20", "30", "10", "5", "5", "5", "15", "5", "50", "55", "60", "5", "5", "5", "95", "5", "5", "5", "95", "80", "95", "5", "10", "5", "5", "15", "5", "20", "5", "5", "5", "5", "25", "85", "90", "5", "15", "10", "25", "10", "15", "70", "35", "20", "5", "5"

"Accessory
Navicular", "15", "20", "20", "10", "10", "5", "10", "5", "40", "50", "60", "15", "5", "15", "95", "15", "5", "5", "10", "5", "35", "5", "5", "5", "5", "15", "10", "20", "5", "5", "50", "30", "95", "20", "25", "10", "10", "10", "40", "95", "40", "30", "30", "10", "5", "5"

"Pez
Planus", "5", "30", "5", "5", "5", "5", "5", "5", "30", "40", "50", "5", "5", "5", "95", "5", "5", "5", "5", "15", "15", "25", "25", "30", "5", "95", "75", "20", "5", "10", "5", "15", "20", "15", "15", "20", "10", "10", "85", "20", "15", "25", "35", "25", "5", "5"

"Gout", "5", "5", "5", "5", "20", "20", "5", "5", "20", "30", "35", "5", "5", "5", "95", "5", "5", "5", "5", "5", "5", "95", "95", "35", "95", "15", "10", "20", "10", "5", "5", "5", "5", "5", "5", "95", "10", "30", "10", "5", "15", "60", "40", "20", "20", "15"

"Posterior tibialis
syndrome", "10", "10", "10", "5", "5", "5", "10", "5", "40", "45", "60", "15", "5", "10", "95", "15", "5", "5", "10", "5", "35", "5", "5", "5", "5", "90", "95", "20", "5", "5", "70", "25", "75", "20", "25", "10", "10", "10", "60", "80", "10", "35", "65", "30", "5", "5"

"Infection", "5", "5", "5", "5", "5", "5", "5", "5", "50", "60", "70", "90", "80", "80", "50", "70", "15", "5", "5", "5", "5", "5", "5", "75", "15", "5", "5", "90", "75", "10", "15", "15", "15", "15", "45", "15", "25", "30", "30", "20", "30", "40", "30", "5", "5"

Fig. 28

H Injury Activities. Please indicate whether you have had an injury recently or in the recent past that may help assess your condition.

1 1 0 none Was there an injury?

2 1 0 none Were you playing a sport?

3 1 0 none Did you trip and fall?

4 1 0 none Did you turn your foot inward?

5 1 0 none Did you have immediate pain?

6 1 0 none Did your ankle/foot swell immediately?

H Injury History. Because of an old injury do any of the following questions apply?

7 2 0 none Did you increase your workout/activity lately?

8 2 0 none Did you feel a pop in the back of your leg?

H Non-Injury Activities. Please select any activity that causes pain or discomfort.

9 3 0 none Walking

10 3 0 none Running

11 3 0 none Jumping

H Select/Answer any question(s) that apply to your current physical state of the ankle or foot.

12 4 0 none Is your ankle swollen?

13 4 0 none Is your ankle swollen on the outside (lateral)?

14 4 0 none Is your ankle swollen on both sides?

15 4 0 none Can you bear weight?

16 4 0 none Does your ankle swell intermittently?

17 4 0 none Does your ankle lock up?

18 4 0 none Can you feel a defect in your Achilles tendon?

19 4 0 none Do you have pain in your heel?

20 4 0 none Do you have pain on the bottom of your heel?

21 4 0 none Do you have pain on the side of your heel?

22 4 0 none Do you have pain in your big toe?

23 4 0 none Is there a bump?

24 4 0 none Is your big toe angled to the side? (see photo)

25 4 0 none Is your big toe red hot and swollen?

26 4 0 none Is your foot flat?

27 4 0 none Is your foot getting flatter?

28 4 0 none Is your 2nd toe longer than your big toe?

H Select/Answer any question(s) that apply to your general physical state.

29 5 0 none Do you have a fever?

30 5 0 none Are you a diabetic?

H Please select any area(s) that you feel tenderness.

31 6 0 none medial malleolus check

32 6 0 none lateral malleolus check

33 6 0 none accessory navicular check

34 6 0 none plantar heel check

35 6 0 none medial heel check

36 6 0 none great toe MTP joint check

37 6 0 none 3rd webspace check

38 6 0 none 2nd metatarsal check

39 6 0 none sole of foot at arch check

40 6 0 none medial navicular check

H Please Select your Age

41 7 0 none 16-40

42 7 0 none 40-60

43 7 0 none 60-80

44 7 0 none Over 80

H A few more question(s).

45 8 0 none Does your toe bend downward?

46 8 0 none Does your toe ride over the next toe?

Fig. 29